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THE GRAPE VINE

ITS PROPAGATION AND CULTURE

BY

JOHN SIMPSON

THE GARDENS, WORTLEY HALL, SHEFFIELD

AUTHOR OF "IMPROVED PRUNING AND TRAINING OF FRUIT-TREES" AND OF
THE SOCIETY OF ARTS' REPORT ON THE FRUIT CULTURE, ETC., ETC.,
AT THE PARIS EXHIBITION, 1878

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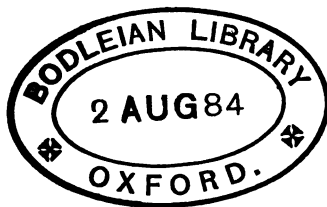
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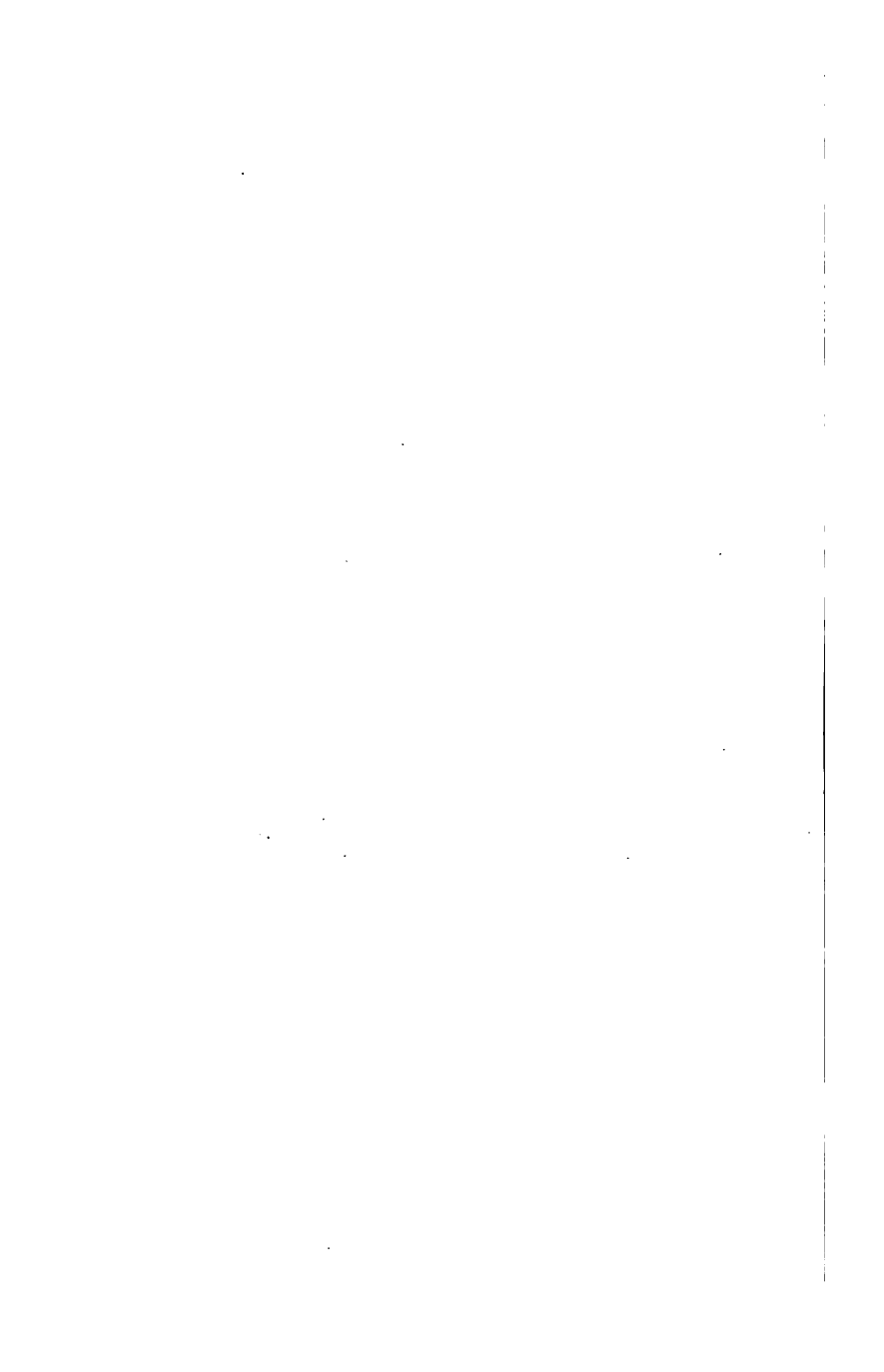
PREFACE.



THE following chapters on the Vine originally appeared in *The Garden*, but have been revised and added to considerably, and will be found to contain the latest records of practice on the subject in a form which, it is hoped, will, to some extent, meet the wants of Grape-growers generally.

THE AUTHOR.

June, 1883.



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the 'information' and 'communication' fields, and the 'information science' field.

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Information science is the study of the nature, structure, and use of information, and the processes by which information is created, communicated, and used. It is a multidisciplinary field that draws on the methods and theories of many other disciplines, including computer science, library science, and communication studies.

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THE GRAPE VINE.

CHAPTER I.

THE GRAPE VINE.—HISTORY.

THE Grape Vine (*Vitis vinifera*) deservedly occupies the place of honour in the catalogue of fruits. It ranks in importance next to Wheat, and, like the latter, has been the companion of civilization from time immemorial—following in its wake to every region of the earth adapted to its growth, and its culture forming one of the most important branches of husbandry. Its native country has never been clearly ascertained, but it has evidently been widely distributed at a very early period. It is supposed to have come originally from Persia, migrating westward through Egypt to Greece, where it was cultivated by the highly civilized Greeks with intelligence and skill, from the days of Homer to the latest date of their prosperity. They appear

even to have been experts in Grape-growing, and fond of experiment, though not free from superstition in some of their practices. Among other feats which they are said to have performed was one which has lately been revived as a secret. This was to produce black and white Grapes on the same cluster, and which they accomplished "by taking a slip of the white and of the purple Grape, and, having split them down the middle, carefully fitting the halves to their opposites so that the buds when divided should meet. They were then bound together with Papyrus-thread, and placed in the earth in a Sea Onion, the juice of which aided the combination of the severed parts." They seem also to have been quite as particular as our modern Grape-growers in the selection of sites for their Vineyards, and in preparing the ground, which they trenched over, throwing the soil into lofty ridges and exposing it to the action of the air, and in this condition it was left for a whole year before planting. From Greece, the Grape found its way into Italy, Spain, and France, its distribution being aided by the Romans in their conquests westward, and its culture, as a branch of husbandry, rose in the course of time to be of national importance in these countries. It is supposed to have been introduced into Britain by the Romans about the second century, while others suppose it to have been imported much earlier, but not to have been cultivated until the Romans set the example.

About the third century, Vineyards were planted in the most favourable parts of the country, and, as civilization progressed, these became more common, and were cultivated more or less successfully for the production of wine and other purposes up till, or near the time of, the Reformation. The Vine does not appear, however, to have flourished so successfully in our island as to encourage its extensive cultivation, and, as the superior wines of the Continent came to be imported in greater abundance, its outdoor culture gradually declined, until it became a thing of the past. But, as the Grape declined in value for wine-making purposes, it rose in estimation as a dessert fruit, and became more common. At first, according to early writers on horticulture, Grapes for the table were grown upon standards in warm situations, and against walls. Gradually, as the demand increased with increasing wealth and a more luxurious mode of living, Grape walls came to be heated with flues, in order to ripen the fruit earlier, and so extend the season of supply. More than 150 years ago, it was stated by Lawrence, in his "Fruit Gardener," that the Duke of Rutland, at Belvoir Castle, did "so much justice to the Vine as to have fires constantly burning behind his sloped walls from Lady-day to Michaelmas," whereby he had ripe Grapes in July. Eventually, flued walls were covered with glass, and, towards the end of the eighteenth century, Vineries con-

structed in a complete and proper manner (for the period) had become common in the gardens of the aristocracy; but it was reserved for the nineteenth century, especially since the abolition of duty upon glass, to witness the great and rapid extension of horticulture in every department, and notably in the culture of the Vine; so that now the Vinery is the common adjunct of every mansion and villa of any pretensions, and not unfrequently of the poor man's cottage; and the Grapes produced under our sunless skies by English gardeners are hardly excelled in any part of the world.

CHAPTER II.

THE VINERY.

Site and Plan.—The site should present facilities for effectual drainage of the soil and sub-soil, if required, and it should have a free and open exposure to the south, east, and west—more especially if span-roofed structures are to be erected—while at the same time shelter from prevailing winds must not be forgotten. But sheltering objects, such as trees or high buildings, should be distant enough to prevent any bad effects from their shade. Nothing is more injurious to Vines than shade, not to speak of the additional cost in the way of fuel that would be incurred thereby, by having to keep fires burning longer morning and afternoon. As far as practicable, a Vinery should receive the sun's rays from sunrise to sunset. The form of the Vinery must depend upon circumstances. If it is for the production of ripe Grapes any time between the New Year and Midsummer, then a "lean-to" is the best for that purpose. Experience has long proved that such a structure

is better adapted than any other to receive and economize the heat and light of the sun during the winter and spring months. For late Grapes—that is, Grapes that have to be ripened be-

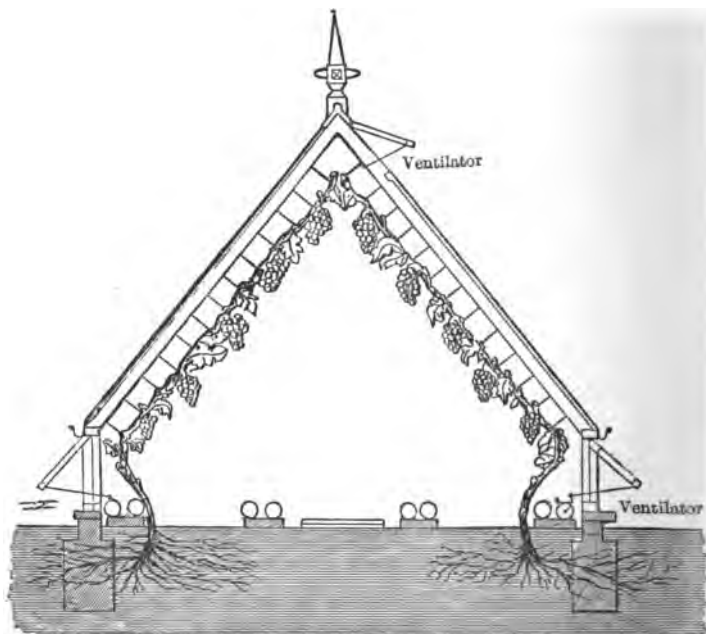


Fig. 1.—Section of a Span-roofed Late Vinery.

tween Midsummer and the end of September or October—a span-roofed house (fig. 1) is the best. It should stand with its ends facing north and south, in which position it receives the light most

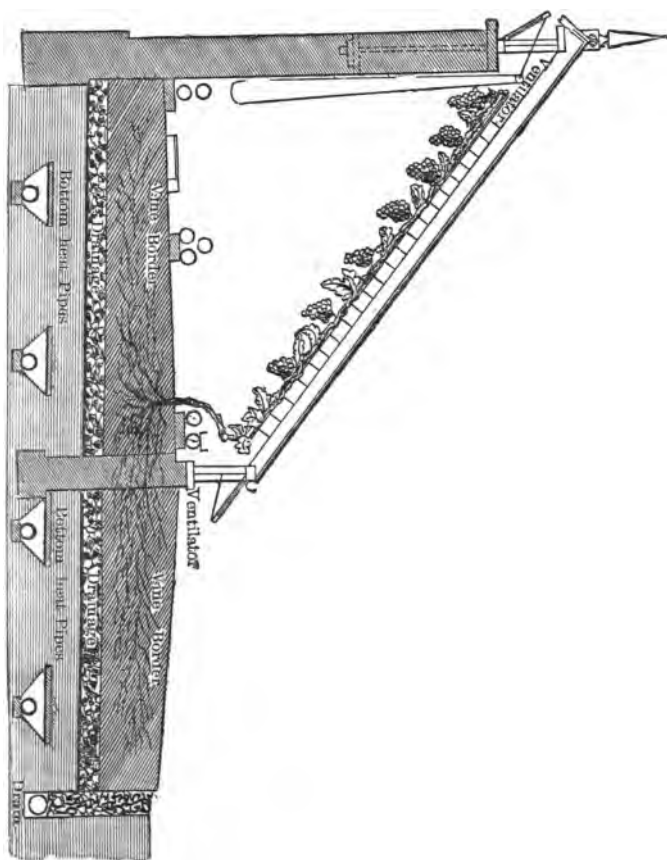


FIG. 9.—Section of a Lean-to Early Vinery.

equally. Fig. 2 is a section of an early lean-to Vinery of the right size and proportions.

Construction and Heating.—The best plan, in most cases, is to employ a professional horticultural builder and engineer to carry out the plans according to order. I need only observe here that wide and lofty houses produce the best results, because they allow of a greater extension of wood and foliage, and can be maintained at a more even temperature, owing to the greater bulk of air which they contain. In a "lean-to," the back wall should be whitewashed. Lightness and elegance should be aimed at in the construction of the roof, and no more wood or iron should be employed than is consistent with strength and durability. The wires for training the Vines, too, should be stretched along the house 9 inches apart, 20 inches from the glass. When nearer than this, vigorous-growing Vines send their shoots up against the glass before it is safe to tie them down, and get chilled by the contact. Heating power, in these days of wide panes and open flaps, should be provided on a liberal scale. In fig. 2, which represents a Vinery 16 feet wide by 16 feet in height, seven rows of 4-inch piping are shown—the least quantity that should be employed for an early Vinery of these dimensions. In localities subject to severe and lasting frosts during the forcing season, I should be inclined to add another single row so as to be

able, when needful, to keep the temperature of the house 50° or 60° above the outdoor temperature, without making the pipes too hot, and thereby scorching up everything in their immediate neighbourhood. The pipes should also be arranged so as to distribute their heat equally throughout the house, and keep the air in motion. In the majority of cases, they are carried round the front or sides of the house, in a block; consequently, when they are heated, the Vines are scorched at the lower part of the house, while they may be suffering from cold at the top. I am aware that those who advocate this arrangement suppose quite the contrary to be the case, but a little reflection will show such a supposition to be erroneous. In a lean-to Vinery, for example, where the pipes are placed close to the front wall, a current of heated air ascends in a direct line from the pipes, and, coming in contact with the cold glass roof before it has travelled more than a few feet, it at once loses a great part of its heat by conduction, and, before it reaches the apex of the roof, its temperature is still more sensibly diminished, and, escaping by crevices or the ventilators, is lost. This is what takes place in a Vinery at night, or at any time when the temperature depends solely upon fire heat, and it explains why the Grapes under such circumstances invariably ripen above the pipes first, and finish off, sometimes, a month later at the top of the rafters. Any one may satisfy

himself on this point by placing a thermometer at the top and bottom of the house when the pipes are heated, and noting the difference. All this, however, is overcome by arranging the pipes as shown in figs. 1 and 2. I have had all the pipes in the Vineries here re-arranged on this plan, with the best results. It is difficult to lay down a rule for ascertaining the exact quantity of pipes required in every case, so much depends upon circumstances and the materials used in construction; but I find, for early Vineries, that 1 foot of 4-inch piping to every 18 or 20 cubic feet of air is generally sufficient for the temperatures which will be hereafter recommended for the Vine. Considerably less piping is required for late Vineries. To keep the atmosphere of the Vinery in a proper state of humidity, there is no plan better than liberally sprinkling the paths and inside borders with water. The Vine is not a plant that delights in a steaming atmosphere. When hard firing is necessary, and a more steady means of supplying moisture desirable, I can suggest nothing better than the usual evaporating troughs, which may either be cast on the pipes, or made of galvanized iron and fitted on. These troughs are less troublesome than flowing gutters communicating with the boilers, as the latter are generally either running over upon the roots of the Vines, or requiring to be filled up as the water in the pipes rises or falls, according to its temperature.

Ventilation.—It is necessary, especially in the case of early Vineries, which are generally going to rest about midsummer and requiring to be kept as cool as possible, that the ventilation should be ample. The usual and most simple plan is to provide openings at the highest and lowest points of the roof. These openings, which should in the aggregate be equal to about a quarter of the area of the roof, including the front sashes, are fitted with swing sashes, which open by a rod and lever, as shown in figs. 1 and 2, so that the ventilation can be regulated as desired. This plan is found safe and effectual enough in ordinarily careful hands, and airing is at all times chiefly a question of attention and judgment; but it has the disadvantage in early forcing, that no sooner are the front lights opened than a current of cold air rushes into the house and comes in contact with the tender foliage before it is more than partially warmed, thereby injuring the Vines in the long run, producing rust and other evils. The obvious remedy for this would, of course, be to heat the air before it entered the house, and some ingenious and successful contrivances have been adopted to effect this object; but they add so greatly to the already much-increased cost of heating, &c., as to be practically out of the reach of all but those to whom expense is no object. The annexed sketch, fig. 3, shows a simple plan of accomplishing the end in view, which I have tried when

necessary with perfect success, and it is so inexpensive as to come within the reach of every amateur, however humble. A is the front row of hot-water pipes inside the front wall of the Vinery; B, a row of earthenware pipes, joined with cement, laid directly under them, and having a row of holes each $\frac{1}{4}$ inch in diameter and 3 inches apart on their upper side; C is the feed pipe, which projects through the front wall into the open air, and at which the cold air enters, and,

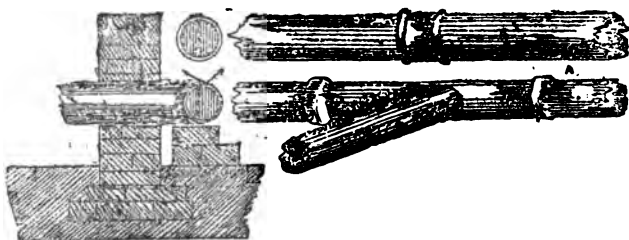


Fig. 3.—Ventilating Pipes.

traversing the earthenware pipes right and left, comes out at the holes at the top, and, passing round both sides of the hot-water pipe, in its ascent gets thoroughly warmed before reaching the Vines. A still more simple plan is to project a single pipe through the front wall to the front row of hot-water pipes, taking care that the mouth of the pipe is just under the hot-water one. This will admit a stream of warm air, and, if the pipes are placed about 2 feet apart, the

ventilation will be ample. The outer ends of the pipes must be fitted with plugs for shutting off the air at pleasure; and, if a piece of wire netting or perforated zinc is fitted into the mouth of each pipe, it will stop rats or mice from getting in.

Ground Vineries.—These are simply span-roofed structures, with movable ends, from 2 to 6 feet wide, and are made in lengths of from 6 to 12 feet. They are laid upon the ground, with their ends running north and south, and the Vines are trained under the ridges. Being portable, they are suited to the wants of the small amateur who can grow a few Grapes in them during the summer, and store plants, or grow salads in them in the winter and spring months. For Grape-growing upon a moderately large scale they are, however, not to be recommended, as it is obvious that their adoption beyond certain limits would be attended with more expense and less satisfactory results than a properly constructed Vinery of equal capacity.

Grape Walls.—A Grape wall to be of any service should be 10 or 12 feet high, 18 inches thick, and flued or piped, so that it may be heated when needful; this will be an undoubted advantage, and hardly more expensive in construction than if no means of warming were provided. A wooden board 14 inches wide, or a

glass coping at the top, throws the rain off and, in a great measure, affords protection from the frost. The Vines are trained to wires placed 6 inches apart, and 4 or 5 inches from the wall.

CHAPTER III.

VINE BORDERS.—HEATING.

By Fermenting Materials.—The propriety of affording the roots of the Vine a temperature corresponding with that of the branches has always been recognized, and the practice of applying heat artificially to the roots by the aid of fermenting materials probably began with the culture of the Vine under glass, or soon after, and is still the plan most generally and necessarily adopted in the production of early Grapes, and in skilled hands has always been productive of good and lasting results. Whether the border be inside or out, a gentle hot-bed, by pushing the roots into early and healthy action, and keeping them near the surface where they are more under control, never fails to produce good effects; and the plan has often been fallen back upon when all other means have failed to get up vigour in feeble and exhausted Vines. Indeed, I am aware of cases where the hot-bed system has been resorted to again in a systematic way after an elaborate

system of heating the borders by means of hot-water pipes had been tried, and failed. The materials for the hot-bed are litter and leaves, which are generally plentiful about most gardens. Stable litter alone is too quick and violent in its action, but mixed with leaves, in greater or less proportions, almost any degree of heat may be steadily maintained for any length of time, provided the bed is turned occasionally and fresh materials added as required. When the hot-bed is the only means available for applying heat to the roots, the border should be covered in autumn with about a foot of litter and leaves, which will be sufficient to keep the soil at a temperature of 50°, or thereabouts, more by preventing the natural heat of the soil from escaping than by any positive action which a layer that depth exercises. As the Vines progress, and the temperature of the Vinery is raised, so must be the temperature of the border by adding more litter and leaves, and turning the whole over and mixing it thoroughly about once in three weeks; and this practice must be continued until the maximum vinery temperature is reached, when the Grapes are approaching maturity. After this, the temperature of the fermenting materials may be allowed to decline gradually, until the Vines are going to rest, when they should be reduced to a mulching only. As a rule it is seldom necessary to keep the temperature of the border above 75° or 80°, even in the case of Muscats; and I find, by

constant experience, that a fermenting bed of an average depth of 18 inches or 2 feet is sufficient to keep the soil of the border at a temperature of 80° 18 inches below the surface. As an instance of the effects of hot linings annually applied, I may state that in 1865 I had to deal with a house of old Vines about sixty years of age, which were in a very feeble condition; but it being necessary to keep them on, and make the most of them for a few years longer, I began by applying hot linings to the border in December, keeping them up till July the following year, the Grapes being wanted in June; and this practice I continued for six years. The effect, after the first and second years' application, was to bring a host of roots to the surface of the border (there were none before), and to restore vigour to the debilitated Vines, from which I cut Grapes of excellent quality annually up till 1872 for my employer's table during the London season. In June, 1871, I exhibited six bunches of Black Hamburgs from these Vines at the Royal Horticultural Society's Show at Nottingham, which were reported upon by the horticultural press at the time as "capital Black Hamburgs, cut from Vines more than fifty years old." The rods were only 14 feet in length, and were cropped at the rate of 20 lb. to the rod; and the last year I took nearly 30 lb. off one Vine. When it became necessary to remove this old Vinery in its turn, I was undecided for awhile whether to retain the

old Vines or plant new ones, so well had they behaved, and so vigorous were they. Their restoration was entirely due to the annual application of hot linings to the border, as in no other way were the roots meddled with. No doubt many instances of this kind could be reported. The hot-bed system has been characterized as cumbersome, untidy, and expensive. It is cumbersome, comparatively, untidy it need not be, and as for the expense, it will be found—when we calculate the expense of heating a Vine border with hot-water pipes, the cost of fuel, and the extra care and attention required in the way of firing and watering, &c., not to mention the fact that over-heated borders have to be protected on the surface somehow—that the hot-bed system is the cheapest in the end. Early Vinery borders are now generally made inside, however, and the hot-bed is not so essential in such cases; but in the majority of gardens no other means of applying heat to the border are available.

By Hot-water Pipes.—No subject connected with Grape culture has been productive of more controversy than this. Some good gardeners advocate this system of heating, while many others, who have had ample opportunities of testing the system practically, condemn it, as being not only dangerous and unnecessary, but even disastrous in its results. I have now be-

fore me a letter from an eminent gardener, the superintendent of a noted establishment, where all the early Vinery borders are heated by hot-water pipes in a most complete manner, in which he reports his past and present experience of the system during the last fifteen or twenty years as follows:—"In reply to your inquiries about the working of the bottom-heat in the early Vineries here, I have to state that I find it of little or no advantage, but the source of considerable danger in our naturally dry and warm soil, if it is not closely watched, so that I have given over using it, except for a few days at starting, after which the fire is put out, and not lighted again till the following season. I always water with warm water, which I believe is quite as effective and far safer than bottom-heat. In cold or wet localities, or soils, a well-arranged system of bottom-heat might be of more service than it is here for early forcing; still it must be used with the greatest caution, even in such places, for a day's neglect by the man in charge of it would pretty well settle the crop for that year. The system was tried in almost all forms at T. when I was there, between 1850 and 1860, and no place wanted it more, considering the soil and climate; but it never worked satisfactorily, and was the cause of no end of 'rows' and extraordinary crops of red spider instead of Grapes. It has long been discontinued there now, and Mr. — only covers his outside borders

with 18 inches of litter and leaves, and wooden shutters to throw off the rain, and has better crops of Grapes than was ever produced there with bottom-heat. This is my experience of the system, but I know of no instance in which it could be said to have worked satisfactorily; in fact, I cannot point to a place where it has paid for the cost or fixing, therefore I am no advocate of the system in any form in which I have yet seen it applied." The experience here related tallies exactly with my own here and elsewhere, and with that of others of whom I have made inquiries concerning the matter. Still, though the system has been hitherto disappointing in its results (and it is doubtful if ever it will bear being measured by a debtor and creditor account), it finds favour with some good Grape-growers, who continue to advocate it. It is not a question of bottom-heat, the advantages of which are undisputed, but how to apply it with safety on the hot-water principle. Vegetation flourishes around hot springs and above subterranean fires, but in such instances the source of heat is so deep as not to be felt injuriously upon the surface of the ground; were it otherwise, the effects upon vegetation would be similar to those produced by hot-water pipes when placed in proximity to the roots of a plant, but place the pipes deep enough, and we get quit of all risk and danger. In fig. 1, I have shown how this may be accomplished. The pipes are laid in narrow chambers

15 inches below the surface of the sub-soil and covered over; the border is then formed above, in the usual way, as if there were no pipes there at all. By this plan the sub-soil has to be heated first, and it is, therefore, impossible that any scorching, or bad effect from pipes made too hot, can take place, such as happens when the pipes are so arranged among the rubble or otherwise that the heat at once accumulates among the drainage at the bottom of the border, and must at times be violent and often irregular, according to the care and intelligence of the fireman. The only objections to this plan are, that the stoke-hole would have to be 15 inches deeper than usual, and the expense of getting up heat would be a trifle more, neither of which are obstacles of any importance. For reasons which any gardener understands, the bottom-heat pipes should be worked by a separate boiler.

Aërated Borders.—This is a simple and inexpensive plan of warming the border (subject to weather conditions), by means of air drains, which run among the rubble at the bottom of the border, and communicate with the air by means of earthenware pipes placed at the outer edge of the border, and at the back wall inside, and projecting a few inches above the surface. The outside air, owing to its greater gravity, descends, and, circulating among the drainage, and communicating its heat to the soil in its passage, is

sucked out by the rarefied atmosphere of the Vinery inside. The drains traverse the border in both directions, intersecting and communicating with each other at right angles every 4 feet; and the tiles, which should be 5 inches in diameter, are laid about 3 inches apart, in order to let the air percolate amongst the drainage, which should fill up the interstices, and cover the tiles over about 4 inches deep. Above all thick sods are laid to prevent the soil of the border from being washed down amongst the drainage, and the aërated chamber is complete. The outside pipes are fitted with plugs, and in working the drains these are taken out whenever the temperature of the external air is above that of the border. When the borders are all inside, as in early Vineries they should be, the aëration system may be adopted by placing the feed pipes at the coldest part of the house, and drawing the air in by an exhausting chamber placed near the boiler, or at the warmest part of the house and into which all the drains lead. This system may be said to have been inaugurated chiefly by Mr. Fowler, gardener to the Earl of Stair, at Castle Kennedy, whose success as a Grape-grower is well known; but, in estimating the results of the system as applied at Castle Kennedy, it must be borne in mind that Mr. Fowler employs fermenting materials in a systematic way as well, applying about 18 inches of litter and leaves to both outside and inside borders, by which means

he keeps the roots of the Vines in a vigorous state of activity.

Inside and Outside Borders.—This has been a much discussed subject during the past ten or fifteen years, during which period a great variety of practice has been recorded, and the general verdict now seems to be that for early crops inside borders are best, and outside borders best for summer and late crops. Owing to the tendency of Vine roots to push towards the outside border, it has also been found preferable to have the border either all inside or all outside, than to have both with the Vines between the two, and allowing them to grow as they choose, in which case the roots almost invariably make for the outside border, and leave the inside border empty.

Formation of the Border.—The Vine will thrive well in a very shallow soil, with ample supplies of water at the roots and frequent top dressings; but the results are more constant and enduring when the soil is moderately deep. Three feet of soil is a suitable depth; which, with 9 inches of drainage, will make a total depth of 3 feet 9 inches to the bottom of the border. A greater depth of border than this has been recommended, but to go beyond 3 feet would be only to incur additional expense to no purpose, and to render subsequent operations inconvenient.

Indeed, where the situation is low and wet, 18 inches will answer well enough. The width of the border must depend upon the size of the Vinery and the extent of training surface. For a house of the dimensions I have given in a former chapter, a border 25 feet wide, including the inside portion, will be required eventually; for, though the inside border had better be completed at the beginning, it is not necessary to form the whole of the outside border at first, which may be completed by ekes added annually for the first two or three years after planting, as the roots are found to progress outwards. These additions give the Vines a fresh stimulus every year, and ensure a more even distribution of the roots throughout the border. When facilities for perfect drainage exist, the surface of the border need not be more than 1 foot above the natural level of the ground at the front of the Vinery, and it may slope down to the ground line at its outer edge. The Vine is a grosser feeder and a greater drinker than many suppose, and more failures have probably resulted through borders being made too high and dry than too low. Operations commence by first marking out the area of the border, and then removing the soil and sub-soil to the required depth, taking care that the bottom has an even slope to its outer edge when finished. When new Vineries are to be erected, this work is done when the foundations are taken out. At this stage, also, the

bottom-heat, if it is to be secured by aëration or hot-water pipes, must be seen to as directed in a former chapter. Here I am speaking as if no such means were employed.

Drainage.—In some situations the sub-soil is so dry that its drainage is neither necessary nor desirable; in others, a single drain 3 feet deep, carried round the ends and along the front of the border, is sufficient; while, in cases where the sub-soil is wet, or the rainfall excessive, the drainage becomes a matter of the first importance. In the latter case, a drain 4 feet deep, having a good fall and a ready outlet, should be carried along the front of the border, and, into this, drains driven across the border from back to front, and 8 or 10 feet apart, should be led in such a manner as to prevent the possibility of water stagnating about the roots or in their vicinity. On the bottoms of the drains 3-inch tiles must be laid, and the drains filled up with broken stones to the top. After this, the concreting of the border bottom must be considered. When the sub-soil is rocky, or of a hard and dry texture, concreting is unnecessary, for the roots of the Vine rarely penetrate such soils—at least, I have never found them to do so, even in the case of Vines planted fifty years or more; but they are pretty certain, sooner or later, to find their way into a soft spongy soil in quest of moisture, and concreting is then the only preven-

tive. An easy and effectual enough way of doing this is to put a layer of rubble about 4 inches deep on the bottom of the border; upon the top of this another layer of equal thickness, composed of smaller stones, broken bricks, or clinkers, and over this, again, a layer of lime, or lime and sand, of sufficient consistency to cement the materials together, rammed hard to form a good crust. If this work is done well—and masons' labourers are the best hands at it—there will be no danger of the roots getting into the sub-soil. As soon as the concrete is hard enough to permit of further operations, 6 inches of drainage, consisting of brickbats or stones, should be laid on it, keeping the largest stones on the bottom, and reserving the siftings for the top. Above all a layer of sods, grassy sides downwards, should be laid, to prevent the soil from being washed in amongst the drainage, and the border is ready for receiving the soil.

Soil for the Vine.—It has long been supposed that the Vine preferred a calcareous soil to all others, which has led to an extravagant use of lime in the formation of Vine borders; but more recent experience has shown that it will thrive quite as well, if not better, upon the red sandstone, and in deep and strong loams. All of which simply goes to prove that the Vine is cosmopolitan in this respect, and adapted by Nature to thrive under very different conditions

as regards soil; hence its wide distribution. It has its proclivities, no doubt, and these should be studied when opportunity offers; but it should also be known, for the sake of that numerous class who have but small facilities, that the Vine will thrive well in any soil that will produce fair crops of Peas and Potatoes, or other vegetables, provided it is as liberally treated as these generally are. Another prevailing notion is that the soil for a Vine border cannot be too open in texture, and to maintain the border in as porous a condition as possible has hitherto been the aim of many Grape-growers; but this notion is fallacious—for, though a border composed of chopped turf is the best to begin with, as the Vines root into such material quickly and get a grasp of the border at once, it is not by any means necessary to keep up this spongy texture, for a hard soil seems as congenial to the Vine as any other. When a Vine is hard potted it invariably makes the most roots and a good cane, and it is the same in a hard border; the roots do not travel so far, but they are far more numerous—in fact, obstruction has exactly the same effect as root-pruning, which has been practised on young Vines with the very object of keeping the roots “at home,” as the phrase goes. I grow many pot Vines here every year, and have compared those which had their roots cut several times before being put into their fruiting pots, with plants grown in the usual way but firmly potted,

and never found any difference either in the crops or the appearance of the roots afterwards. What is generally denominated a "strong loam," of a solid texture, is the best for sustaining the Vine in vigour and fertility for a long period; and from choice I would prefer the top spit of a heavy pasture land to any other for border-making. From such a soil constant and heavy crops and large berries may be confidently expected, and the least shanking, if any. The soil here is of an unusually heavy character, and borders composed of turf originally soon settle into a solid mass; but Vines thrive long and well in it, as the following instances will show. Up to three years ago we had a house of Vines, Black Hamburgs, which had been growing in the same border for sixty or seventy years, and which, so far as I could learn, had always borne good crops of Grapes. The border, which was outside, and about 3 feet deep and 16 feet wide, was composed entirely of this heavy loam, apparently without any admixture, and had long ago become a hardened mass. About twelve years ago a new Vinery was built over the old Vines, it being considered preferable to keep them on to planting young ones. The new Vinery, being larger, permitted their further extension, which improved them considerably, and for the remainder of the time—eleven years—they were forced for a second early crop, and always bore fine fruit. When it became necessary to do away with these

Vines in order to extend our late Vinery, I had the curiosity to examine the condition of the border and the state of the roots. After removing the surface soil—which had accumulated in the course of years to a depth of 15 inches—I came upon the original yellow loam of the border, and found it to be permeated in all directions with roots of the most healthy description, which explained the long-sustained vigour of the Vines; but I confess the soil, both in quality and texture, was not such as I had at one time regarded as favourable to the Vine, for it was stiff and tenacious, almost approaching to clay. We have another Vinery here—a ridge-and-furrow—50 feet long and 6 feet wide, with a restricted training area, containing four Vines, which annually bear close upon 400 lbs. weight of Grapes every year, and the berries (Hamburgs) are seldom under an inch in diameter on the average. These Vines are growing in an unprepared border, about 3½ feet deep, of the same stiff loam; and, though the roots are all outside, and only protected in winter by a mulching, they are always to be found in a state of good health. A hard soil is the driest of all soils. These and other instances of the same kind have led me to prefer a strong loam to all others for the Vine; and if it is a sandy loam, so much the better. There is no doubt, however, that lasting results can be obtained from light loams as well, but they require more feeding and attention. The old

Vines at Cole Orton Hall afford a remarkable example of successful culture in this respect. Mr. Henderson has had charge of the gardens there for thirty-five years, and it is well known that during that time he has been one of the foremost exhibitors at our great shows—his examples as a rule fairly representing the crops produced annually for his employer's table. Mr. Henderson disclaims being a sensational Grape-grower, rightly measuring success by its continuance, neither is he a believer in expensively formed Vine borders, having proved by long experience that the best results can be obtained by simple means intelligently applied. Information regarding the Vines and borders at Cole Orton will doubtless be acceptable and instructive, and, through the courtesy of Mr. Henderson, I am able to give it in his own words. He says: "The principal Vine borders here were made before I came to this place in 1838, and the Vines have been planted forty-three years. I do not attribute the excellence of the Grape altogether to the materials of which the borders consist, but to the constant drawing of the Vine roots to the surface by means of manure put on the borders, about a foot thick, every year, thereby raising a gentle heat. Our soil is rather a light loam on the red sandstone formation, and the only Vine borders I have made here were made of this loam, with the addition of one-twelfth of good stable manure. No other materials were used,

and the Vines planted in this have always borne the best Grapes. The borders were only made 7 feet wide and 18 inches deep, and the Vines have been bearing for thirty-four years." Such is the simple story of one of the most successful Grape-growers in this country. I am acquainted with another exactly parallel case. In a little Vinery belonging to a country clergyman with whom I am acquainted, crops of high excellence have been produced for twenty years. The minister is an enthusiast in Grape-growing, and attributes his success to that, and heavy waterings, mulchings, and liberal manuring. The border was originally composed principally of the garden soil, trenched over and manured. Mr. Coleman, of Eastnor Castle—who also produces excellent crops of Grapes from aged Vines—attributes his success to the use of a moderately heavy loam from the volcanic formation in his neighbourhood, which, he says, does not retain its fibre long, but nevertheless induces a profusion of healthy roots, such as the calcareous loam, which he has also tried, never does. Mr. Coleman was led to try this soil from observing that fruit and other trees grew well in it—not a bad way of guessing at the quality of the soil at any time. Gardeners have generally to choose soil from their own locality, and they will not err far if they always select the top spit from localities where the Oak, Ash, Lime, or Sycamore are observed to thrive well. The turf

should be taken off the ground when it is moderately dry; and if it cannot be prepared and put into the border at once it should be stored in a dry shed, and there chopped up with the spade. If the soil is of an unusually heavy texture, one-third of decayed and rotten manure and river sand may be added to it to lighten it; and in all cases a considerable quantity of broken bones and bone-dust should be used, and in non-calcareous soils about the same quantity of lime scraps. The whole should then be turned over and mixed several times, and left till wanted. If the borders can be got in readiness for the reception of the soil a month or two before planting time, so much the better, as it gets time to settle, and there is less danger from fermentation, which often occurs with fresh turf.

Borders of Common Soil.—In cases where the means for forming Vine borders as here directed are not available, the site may be drained without removing the natural soil if it is an ordinary fair sample; and, after doing this, the border should be trenched over 2 or 3 feet deep, according to circumstances, adding at the same time a good sprinkling of broken bones and half-rotted cow-dung or stable manure, mixing the whole together as the trenching proceeds, and taking care at the same time to level the surface of the sub-soil in a regular way as each trench is turned over, and to ram it well with wooden

rammers if it is of a soft texture, to prevent the roots from getting down into it. Excellent Grapes are frequently grown in such borders. Whatever soil is used it should be chopped and mixed, and the border filled several weeks before planting the Vines, in order that it may have time to settle.

CHAPTER IV.

PROPAGATION AND PLANTING.

Propagation by Seed.—This plan is seldom resorted to except with the object of raising new varieties, as seedling Grapes vary greatly, two varieties seldom coming alike. In this respect the Grape-vine resembles other cultivated plants, the seedling progeny of which, as a rule, sport widely. The Author has at times raised, or assisted at the raising and proving of many seedling Vines, including several well-known new Grapes, and always observed this tendency to sport, and that the proportion of good kinds, from the Grape-grower's point of view, was small; and this, I believe, is the experience of all raisers of new Grapes. Without going at length into the subject of raising new varieties, it may be stated here that the best results are likely to follow intelligent cross-breeding between good kinds. To accomplish cross-fertilization, certainly and successfully, by the removal of the anthers, before the natural pollen is developed, and the application of pollen from another variety, is a difficult

operation, which has probably rarely been attempted in the production of new Grapes, the usual plan being simply to reduce the flowers of a bunch to a given number before they expand, and fertilize them with the foreign pollen as soon as the buds burst, trusting to the chance of a cross being effected, in some cases at least, and determining the success or failure of the operation by the character of the fruit of the progeny. I believe there is no better foundation for the reputed parentage of some good new Grapes than this; nevertheless, I have no doubt of them being the *bonâ-fide* crosses they are represented to be, because they show the characteristics of both the parents. On the Darwinian hypothesis, that Nature abhors self-fertilization, the probability is that the above simple method is often successful. There is, however, a good chance of getting valuable new kinds from the seed of self-fertilized good varieties of Grapes, and, as seedlings are easily raised and proved, any one may try their hand at such work who possesses a Vinery.

Grape seed should be sown early in February in a stove heat. A number of seeds may be sown in a 5 or 6-inch pot, in a fine light compost of loam, sand, and leaf-soil, in equal quantities, and covered in about half an inch deep. They soon germinate if kept moist, and as soon as they have made their first leaves beyond the seed-leaf they should be carefully shaken out of the seed-

pot, like young cucumbers or melons, and potted singly, in the same compost, in 4-inch pots, and placed again in the stove or warm Vinery, where they will receive plenty of light. Later on, they should be planted out or shifted into 10-inch pots, and afterwards grown on like other young Vines till the end of the season.

Fruiting Seedlings.—Seedlings produce tall, but slender, canes the first season, but grow much stronger when planted out in an inside border. Some plants may, probably, produce a few small clusters of fruit the second year, and which will afford some idea of the size of the berries and their flavour; but of the general habit or fertility of the variety, size of bunch, &c., no correct estimate can be formed until the third or fourth year. If the plants are enarched on good established Vines they can be proved sooner, and some should always be grown in that way; but it is desirable to try all new Grapes on their own roots as well. Any number of plants may be proved by enarching, as only a lateral of the seedling need be grown, and several may be put on one Vine, and afterwards removed without doing the foster-parent any injury. The aim should be, under any circumstances, to grow and fruit the Vines during the natural season, taking care to ripen the growth well and not to overcrop until the good kinds are proved.

Propagation by Grafting.—I have often had occasion to graft Vines, and never adopted any other plan than *enarching* by the green wood. For convenience and expedition it beats any other plan I am acquainted with, and I know many good cultivators who never adopt any other plan, no matter how old or how young the Vines are. The only preliminary preparation needed is to have the scion, in the shape of a plant in a pot or planted out, ready and convenient when it is wanted, and to see that both stock and scion are at the right stage for the operation. Very recent growth does not unite quickly, the wood must be quite green and growing, but just getting *woody* to the touch of the knife. At this stage bring the two together at the desired point; with a sharp knife remove the leaves of both where the union is to be, leaving a good head of shoot and leaves *above* that point; then cut a slice of the scion and stock, not quite into the pith, and about two inches long; bring the cut sides together, fasten the two above and below the wound with a piece of soft matting, and with another soft piece bind the two shoots together, firmly, the whole length of the cut, taking care that the edges of the stock and scion meet on one side at least. The union must be quite close, and so long as the matting does not cut into the shoot it is not too tight. After the operation is finished, tie the Vines so that the graft is not likely to be shaken or moved. In a

fortnight a partial union will be effected, and the binding should then be examined and slightly relaxed if it appears to be cutting into the bark, but not quite removed till the union is complete. While the union is taking place the scion should be encouraged to grow beyond the graft as much as possible, and the growth of the stock beyond should also be encouraged in a limited degree; but when the scion is safely established the stock above the graft should be cut clean away. Grafting is performed generally with the object of improving or strengthening weak-growing varieties, that do not do well on their own roots, hence, in selecting a stock a vigorous constitution, fertility, and a corresponding habit of growth should be the main considerations. The full benefit of any stock is only gained when a portion of it is also allowed to grow, as well as the scion. We have always either grafted our Vines half-way up or had one limb of the stock and another of the scion; but it has lately occurred to us that double grafting would be better still in the case of some delicate sorts—that is, to put the scion in the middle of the Vine, and having a portion of the stock variety both above and below it.

Propagation by Eyes.—The presence of such a scourge in this country as the *Phylloxera vastatrix*, with which it is almost hopeless to contend when once it has established itself in a Vinery,

makes it more important than formerly that every Grape-grower should raise his own Vines. Were this practice generally adopted, the spread of the disease would doubtless be greatly checked. In those places where it has broken out most destructively, it has pretty clearly been traced to the nursery, or other establishment, from which the Vines have been obtained. Considering, therefore, how great the risk is, and how easily and cheaply the Vine may be propagated at home, I would recommend the practice of planting young Vines from eyes the first year, wherever possible. I have seldom adopted any other plan, and I have always found such plants make just as good cane as one-year old plants, which would probably cost 10s. 6d. each at the nursery. There are two methods of raising plants from eyes. Hitherto the usual plan has been to insert the eyes in small pots filled with soil, from which they are afterwards shifted into larger pots as the plants grow, and eventually planted out in the border. The other, and better plan, is to strike the eyes on small turves, which are afterwards transferred to pots or the border when the plants have grown a little. By this plan the Vine may be said to be planted as soon as the eye is put in, for from that time it receives no check whatever, which is the whole secret of the matter; and any healthy Vine eye so planted ought to make a vigorous cane the first year, unless prevented by accident. During the last ten years I have propagated hundreds of

Vines in this way for potting and planting, without failure in any instance. Besides, a hundred Vines may be raised just as easily as a dozen, and as many supernumeraries as can be accommodated may be planted for fruiting the first year; whereas, had such to be bought, they would cost a considerable sum of money. When the plants are struck and grown on in pots till the planting stage, they receive a check every time they are shifted, let the operation be ever so carefully performed; this arrests the growth at a very critical period; and the chances are that failure will be the result, so far as getting a good cane the first year is concerned. Besides, pot plants often and unavoidably suffer from neglect in watering, which has a stunting effect upon them, leading to premature ripening at the neck, from which they do not recover the same year. An uninterrupted growth from the beginning is the secret of raising young Vines from eyes; and this is secured most certainly and easily by the turf system. The *modus operandi* is very simple. I first of all secure shoots for eyes from the best ripened Vines, always preferring short-jointed lateral shoots to leading ones. These are generally taken off in November or December, when the Vines are pruned, labelled, and laid in soil by the heels in a cool-house till wanted in spring, taking care they do not get parched for want of water at any time. During the interval a small quantity of light, tough, fibry turf free from

wire-worm, is procured and stored in a heap in order to kill the Grass roots before using it, as these grow and are troublesome when the turf is used fresh. When the time arrives for planting the eyes in February, or early in March, the best turf is selected, and cut into pieces 6 or 7 inches square and 2 inches deep, a hole large enough to bury a small Walnut in the centre of each piece being scooped out at the same time. The sods are then arranged closely together in a square, on a temporary platform of boards, or on the floor, where they can receive a bottom-heat of 70° or 75°, and where the atmospheric temperature ranges from 65° by night to 80° by day, with plenty of light and sufficient ventilation when required. At this stage, also, if any danger is apprehended from wire-worm, I give the sods a good soaking with boiling water, which generally settles such vermin and kills the weeds as well. I then prepare the eyes, by cutting them out with a secateur, half an inch above and below the bud, and taking a slice off behind each with a sharp knife nearly into the pith. A single eye is then planted in each turf, and covered over slightly with finely-sifted light soil; the crevices between the turves are also filled up, and the sods covered over with just sufficient soil to hide them, leaving an even surface for watering. I may here state that I have started Vine eyes in a considerably lower temperature than is here recommended; but, like cuttings gener-

ally, they require a rather high temperature to start them successfully at first, as the vitality is apt to flag, and the buds to perish, under a temperature that would be quite sufficient to bring the buds into leaf were they still upon the Vine. I, therefore, recommend the above temperature as safe and quite high enough. The only attention the eyes will require after planting in the sods will be occasional watering. A sprinkling with tepid water is generally enough, for the sods retain their moisture for a long time. When the eyes break, and have made a few fully-developed leaves, the turves should be examined; and if the roots are found to be pushing out at the sides, they must be re-arranged more thinly—say 18 inches or 2 feet apart each way, and the intervening spaces filled up as before, with fine soil, to the depth of the turves. At this stage it will also be seen which plants are likely to be the most vigorous; and if more eyes have been planted at first than are required, the weakest may be discarded to save space, and only a few more than will be wanted, retained in case of accidents. From this time the plants will grow rapidly, and the young rootlets will soon be ramifying in all directions in the fine soil which surrounds the turves; and the advantages of such a rooting medium will be discovered when the Vines come to be planted in the border. The other way of propagating by eyes is simply to place those in 5-inch pots in

good compost, and pot on afterwards as when raised on turves.

Planting.—If all has gone well, plants propagated in the above manner will require to be transferred to the border four or five weeks after they have been re-arranged, as, by that time, the roots will be encroaching upon each other. Presuming the inside border has been prepared, the position of each Vine should be marked off, and the site smoothed with an iron rake. The permanent Vines should be planted along the front of the Vinery, 5 feet apart, to allow of two rods to each Vine, eventually; and between them should be planted supernumeraries, for fruiting the following year, or longer if required. This will leave the plants $2\frac{1}{2}$ feet asunder. In addition to these, another row, consisting of supernumeraries entirely, should be planted along the middle of the border $2\frac{1}{2}$ feet apart, so that they will just catch the wires where the front supernumeraries are stopped, as will hereafter be directed. In this way nearly the entire roof is covered with bearing wood the first year, and a heavy crop of Grapes is secured the year after planting, without interfering with the permanent Vines. I am here supposing the Vinery planted to be a “lean-to,” but a span-roof would be planted in the same manner, only double the number of Vines would be required. Should a dull day not happen opportunely for planting, it should be done in

the evening after the house is shut up. The soil about the sods should be allowed to get dry a day or two before, in order that the turves with the roots hanging to them may lift without injury, and when all is ready each sod should be lifted with the hand, and the roots pulled away steadily from the light soil, which, being dry and shallow, will offer no obstruction; and all the roots will come away easily without the loss of a spongiole. Presuming the plants have been prepared near the house where they are required, it is better to carry them in the hand, as they are lifted, to the place where they are to be planted; and as one man deposits each turf on the border in its place, another covers the roots over with a little soil. After all are planted and watered with tepid water, each Vine must be supported with a small stake. In this way I have planted some scores of Vines in half an hour, and so little check did they experience, that I never had to shade the plants afterwards; whereas, had the plants been transferred from pots, and had the roots to be disentangled and spread out, shading and nursing for some time afterwards would have been indispensable. In recommending the above plan of raising and planting young Vines, it is, of course, presumed that an inside border has been prepared for them, if only a strip sufficient to allow of planting inside the house. When the border is all outside, and the Vines have to be brought

through holes in the front wall, one-year-old plants are to be preferred for planting. When I have had to operate with these, I have generally raised the Vines the year previous by the turf system, transferring the plants to 12-inch pots after the eyes were struck, and growing them on without bottom-heat, and well exposed to the light during the summer, and planting them the following spring. Those who cannot raise their own Vines must, of course, buy them from the nursery or elsewhere, and they should see that they are free from disease, true to name, and well ripened, by selecting their own plants at some respectable nursery. Nearly all nurserymen sell Vines, but all do not grow their own stock, but contract with private growers or others to grow the plants for them; and, as it is merely a commercial speculation, the plants are as often as otherwise grown in bottom-heat, or under the shade of other trees, and turned out in autumn, in a partially ripened condition, to the nurseryman, who places them out of doors, exposed to all weathers, till the leaves fall off, or until he can find accommodation for them under glass. The effects of this treatment upon ill-ripened Vines with soft tender roots are simply disastrous, and such plants are unfit for any purpose, though thousands of such are sold every year for fruiting and planting. If the intending planter will, however, buy his own Vines from the raiser in autumn, and winter them himself in a cool-

house, he is not likely to be disappointed. Some prefer planting when the canes are ripe in autumn, just before the leaves are shed, in order that the plants may get partially established and be ready for a start in spring; but the advantages in this respect are hardly appreciable, and as autumn planting necessitates the making up of the border before winter sets in, the soil gets soddened, and the fibre of the turf decayed long before growth commences. It is, therefore, better to defer planting till March. The canes should be cut down to within about 2 or 3 feet of the pot six weeks before planting. This length of cane will be required to reach the bottom wire to which the cane is tied after it is planted. When the border is ready, and the soil has subsided, which it always does in newly-formed borders, a semicircular hole about 3 feet wide and 6 inches deep must be taken out opposite each of the holes in the front wall, through which the Vines are to be taken. The Vines should then be shaken thoroughly out of the pot, and the roots carefully combed out with the hand. The point of the cane is then pushed through the hole in the wall, and while one person inside ties it securely to the wire, another spreads the roots out with a radius on the bottom of the hole, covers them with soil, and waters them. No part of the cane should be buried, as is often done, in the erroneous belief that extra roots are formed, whereas nothing of the kind takes place,

as I have proved conclusively over and over again. True, roots will be emitted from the part buried, but it will only be at the expense of the natural and proper roots of the Vine. I have often taken up Vines so planted in the border, and in pots, at the end of the first season, to be certain on the point, and have invariably found that while the cane had struck afresh at the buried part, the natural roots had scarcely moved at all, but remained almost in the same condition in which they were planted, whereas those that were not buried made the best roots, started into growth soonest, and made the strongest canes. After the Vines are planted, the border where the roots are, and for a few feet farther out, should be covered with 15 inches of litter and leaves, which will afford a gentle heat to the roots, and greatly promote success.

CHAPTER .V.

TREATMENT AFTER PLANTING.

LEAVING the subject of temperature to be fully discussed hereafter, I may only remark here, that in the daily temperature, the maximum should be reckoned at noon and the minimum at sunrise, and go on to speak of newly-planted Vines from eyes, which, in my last chapter, we left enjoying a night temperature of 65° , and 80° by day. These figures are only given as averages, however. Supposing the temperature of the Vinery to stand at 85° at mid-day, my practice would be to reduce air gradually and shut the house up to its maximum temperature about two o'clock P.M., sustaining it by fire-heat if needful, and allowing it to subside gradually to 75° at dusk, to 65° about ten o'clock, and to 60° in the morning, or to 50° in cold weather, rather than resort to hard firing. This practice is not troublesome; a little experience soon enables one to judge how much fire-heat is necessary to counter-balance the out-door temperature under all circumstances. As the Vines progress, and the

days lengthen, the night and day temperatures should be raised by degrees until about June or July, when the minimum night temperature should not fall much below 70° , and the day temperature should be run up to 80° in dull weather, and to 85° or 90° with sun-heat; shutting up the house on such occasions 5° above these figures, but making some abatement for the night temperature at the same time if the nights are cold. For such varieties as the Muscat of Alexandria and Barbarossa a temperature 5° higher all over will be required. These temperatures should be maintained until the canes get brown and hard to their extremities, which will be towards August or September, according to circumstances. After this the temperature should decline at the ascending ratio, till fire-heat is discontinued and the house thrown open altogether.

Temperature of the Border.—If the border is heated by any of the means before described under the head of “Bottom-heat,” the temperature should be maintained during the growing season at about the mean temperature of the Vinery at all stages; thus, supposing the minimum night temperature of the Vinery at starting time to be 40° , and the maximum day 75° , the mean would be 57° , omitting fractions. The mean, however, should not be exceeded; it is better to be under than above it. Where hot-

water pipes are employed they should be used with the greatest caution, and air drains should be opened only during the warmest part of the day, and when the out-door temperature is considerably above the temperature of the border. Borders under fermenting materials should always be tested by thermometer 18 inches below the surface of the soil, or where the roots are known to be, and, when the heat is too violent, treading the litter well with the feet will always lessen the fermentation quickly, while turning and mixing the materials, and, when necessary, adding to them, will increase the heat.

Airing.—Closely connected with temperature is the question of airing. Air, less or more, should be admitted to the Vinery at all times, except when the weather is so cold as to necessitate closed ventilators in order to maintain the required temperature. When hot-air ventilators are employed, it will be easy to admit fresh air in the coldest weather, but these will not be sufficient on sunny days, and the ordinary back and front shutters will have to be worked. Beginning in the morning with the rising thermometer, all good practitioners make it a rule to admit air little by little, at both back and front, until the maximum amount is reached with the noonday temperature; after which the air is reduced by degrees, until the house will bear shutting up at or above the maximum temperature as before

directed, but the ventilators should never be closed altogether; about a $\frac{1}{4}$ inch of air should be left on along the top and bottom. To make sure of this, when the Vineries are in charge of different individuals, I have a piece of thin lath tacked on temporarily under each shutter to prevent it closing entirely. Of course, the scale cannot be adjusted so nicely as is here supposed, but the principle indicated should be held in view. Quick rises and falls of the temperature, or sudden gusts of air rushing in against the foliage, are evils that will surely tell upon the Vines in the long run. In warm weather, such as we sometimes experience in June and July, it is advisable to leave the ventilators wide open day and night. Shutting up should only be resorted to to economize sun-heat, but when the temperature can be kept up without such aid it is in every way better.

Damping.—This is a term generally used to denote a practice necessitated by the use of artificial heat; though at one time damping and steaming was carried to such an extreme in the culture of the Grape, that one might suppose the Vine delighted in an atmosphere in a continual state of saturation; whereas exactly the opposite is the case—a balmy, dry atmosphere, with abundance of moisture at the root, is probably the most favourable condition that could be conceived for the Vine; but under glass, and the

influence of fire-heat, an artificial state of aridity is produced, especially in sunny weather, which is very trying to the tender foliage of the Vine, and the only preventative is damping, in a discretionary way. For instance, most gardeners know how difficult it is to steer clear of danger on those occasions, when the pipes have been made hot in the prospect of a dull day, and the sun suddenly and unexpectedly shines out in a forenoon, accompanied, perhaps, with a cold, dry, shrivelling wind, which makes it dangerous to open the ventilators more than a few inches; while, on the other hand, danger is equally imminent from a too high temperature, unless air be given. In such a dilemma damping is the safeguard, for a liberal sprinkling of the inside borders and paths with water, which quickly evaporates and loads the atmosphere with moisture, reduces the temperature and lessens the necessity of giving more air. For similar reasons, damping is also necessary when a Vinery is shut up at a high temperature in the afternoon. A moist atmosphere arrests the excessive perspiration from the foliage, which would otherwise take place in a high and dry temperature, resulting in what is usually called burning, or scorching of the leaves. Damping of floors, in fact, should always be resorted to in droughty weather, especially if the leaves of the Vines are observed to be flagging under a bright sun; or to sustain the necessary degree of moisture in the air when

hard firing is required. The evaporating troughs on the pipes may always be kept full, as they will only give off moisture according to the heat of the pipes, and consequently supplying the greatest quantity of moisture when it is most needed. Syringing the Vines should never be practised with a free circulation of air, but only when the house is closed, otherwise the effect will be destructive. As far as possible, soft water should be used for syringing. If the rain-water from the Vineries is collected into tanks inside the Vinery, it will afford a supply for this purpose; and the slightly sooty character which water so collected always has will be no disadvantage to the Vines if the water is allowed to settle before using it; soot is disagreeable to the insects which infest the Vine. In dull weather, when little ventilation can be afforded, damping in any form should be avoided, as it only induces a watery growth and tender foliage, which flags before the first bright sunshine.

Watering.—Inside borders want a good deal of attention in watering when the Vines are growing, and it is chiefly a question of judgment. With young Vines, whose roots have not extended far into the border, each plant must be watered separately at first, and the whole border should be kept in a sweet and moist condition. The roots rapidly extend themselves, however, when the Vines are fairly started into growth;

it is then better to deluge the border thoroughly with water at the temperature of the Vinery, whenever watering is supposed to be at all needful; it is hardly possible to overdo it in this respect when the border is well drained.

CHAPTER VI.

TEMPERATURE.

THE earliest varieties of the Vine require about five months to ripen their fruit from the time of starting the Vines; but kinds like the Black Hamburgh are better allowed six months. Late varieties, like the Muscat of Alexandria, Gros Guillaume, and others mentioned in the list of late Grapes at the end, require nearly eight months, but the Alicante and Lady Downes can be ripened perfectly between the beginning of April and the end of October. Grape-growers have, therefore, only to calculate when they will need any given crops to be ripe, and start their Vineries accordingly. Before starting the Vines they should be washed and cleaned, and so should any portion of the Vinery inside; the border should also receive a good watering.

As regards temperature a few noteworthy fruit-growers allow considerable latitude, preferring rather to be guided by circumstances and weather conditions, than by hard-and-fast

rules. With the Vine, however, in the earlier stages of forcing, unnaturally, not to say injuriously, high night temperatures have been the rule hitherto; but a great change has taken place of late years in favour of lower temperatures, as being both better for the Vines and more economical. If we compare the night temperatures generally recommended for the Vine, from the starting period till the setting of the fruit, it will be found that they far exceed the average night temperature during the same period of growth in those countries most favourable to the Vine; and what makes the matter worse, these excessively high temperatures are given under circumstances which only increase their power of mischief; as, for instance, when the Vine is forced in a Vinery under our cloudy skies, and during the long dark nights of winter and spring. When the Vine is growing, the night temperature must, of course, bear some proportion to that of the day; but night is the period of rest to plants, which rest means a suspension of those exciting influences—heat and light—under which, combined, perfect growth can only take place. Physiologists tell us, and experience proves, that though the shoots will lengthen nearly as much by night as by day, under a disproportionately high temperature, no new material is formed. What takes place is, in the words of Dr. Lindley, “simply an extension of the tissue formed during the day,” and the

consequences are weak wood and foliage, that can ill resist the effects of hot-water pipes, insect attacks, and other evils that the gardener is only too familiar with. Bearing these facts in mind, I have deviated considerably from the beaten tract, and have, when hard firing would have been necessary to sustain the desired temperature, subjected all sorts of Vines, and notably Muscats, at all stages, between the starting of the Vines and the setting of the fruit, to a night temperature, that would at one time have been considered so low as to be fatal to the setting process, and injurious to the Vines generally, but with results so actually favourable to the health of the Vines, and the setting of the berries, that I now adhere to the practice in all cases, and have no hesitation in recommending it to others, as being probably most in accordance with Nature, safe, and, without doubt, the most economical as regards fuel. I have repeatedly subjected Muscats to a temperature of from 50° to 55°, and lower, at night, for a fortnight at a time, according to the weather, from the time the flowers first opened till all the berries were set, damping the house as usual, and occasionally syringing the Vines and bunches in the afternoon, and the berries have invariably set as thick as Hamburgs generally do. I put this success down simply to the sturdy vigour acquired by the shoots and bunches, through the absence of high and stimulating night temperatures, for

I depart but very little from the usual day temperature. One fact, which I regard as conclusive evidence that a low, or resting night temperature is favourable to the fertilization of the berries, is the number of stones or seeds they contain. Under high and dry setting temperatures I have seldom found the berries of Muscats to contain more than two or three seeds, but since I adopted low temperatures I find the average number is about four, and not unfrequently they contain five. In practice, therefore, instead of adopting a night temperature, which, in the usual acceptance of the term, means reaching the minimum about dusk, and sustaining it by fire-heat, if necessary, till the following morning, the rule should be to reckon the maximum at noon, and the minimum at sunrise.

Night Temperatures.—Beginning with a newly-started Vinery, no harm will result if the temperature falls to 35° every night till the buds break; such a low temperature is preferable to a high one by means of hot-water pipes or flues. After the buds break, and from that period onward till the bunches come into flower, a night temperature of from 45° to 50° will be sufficient in cold weather. During the flowering period the minimum should be 50° at sunrise, and after flowering and onward till the Grapes are ripe, it may range at from 60° to 70° by *fire-heat*, according to the weather.

Day Temperature.—From the time the Vinery is started till the buds break much should be made of the sunlight, aided by fire-heat. The heat should be got up early in the day; on dull days the maximum should be 60°, and in sunny days 70° or 75°. After the buds have broken, and from then till the Vines come into flower, the maximum by sun should be 80°, and in dull weather from 65° to 70°, according to the temperature out of doors. When the berries are all set it should be raised to 85° or 90° on fine, and 75° on cold and dull days, and a lower temperature should not be given till the fruit is ripe, except in the case of very early Grapes, forced during cold weather.

CHAPTER VII.

PRUNING AND TRAINING.*

The Spur System of Training.—The Vine used to be trained in various different ways, but the spur system is now almost universally adopted in both indoor and outdoor culture, and as it is superior to any other, more easily understood, and admits of various modifications according to circumstances, it is not necessary to mention any other here. By the spur system the Vine forms single rods or canes, upon which the lateral or bearing branches are produced from the alternately placed buds on each side, and which are usually thinned out to from 12 to 18 inches asunder under good culture. The rods may be trained in any direction—upright, obliquely, or horizontally. The upright and the horizontal are the most convenient methods, the first having the preference as a rule, but the horizontal is the one that ensures the most regular breaking of the buds, an important point when any length of young wood is left. In the upright method the

* Extracted from "Pruning and Training Improved."

rods are simply trained straight up the rafters or wall of the Vinery, and in the horizontal they are trained in the contrary direction. The easiest way to carry out the latter method is to train the Vine in the same manner as a horizontally-trained Pear tree: that is, with an upright trunk from which the branches are led away at right angles.

Distance between the Rods.—On this point authorities differ considerably, some maintaining that from 3 feet to 4 feet asunder is no more than sufficient for lateral development, while others would not allow much more than half that space. The distance apart which the Vines are planted does not affect the question, as few or many rods may be trained from one root. There can be no doubt that the way to get up the most robust Vine is to afford ample room to the branches, but it is doubtful if the above space be required to produce either the strongest Vines or the finest bunches. The annals of sensational bunch-growing do not show the advocates of wide training to have the best of it, either in general weight of crop or permanent fertility, and it is certain that they have been almost invariably beaten in the matter of quality. One and a half pounds of good Grapes to the foot-run of the Vine rod is considered a fair crop by good judges, and that weight has been often attained on Vines grown 2 feet asunder, or at the rate of

3lb. to the foot for two rods occupying a 4-foot light, and it is doubtful if that weight has been exceeded on an average, or always attained in any Vinery where the rods had double the space allowed them, all other things being equal. Mr. Meredith, of Garston, grew his Vines about 2 feet apart—indeed they looked crowded; and the author of “A Practical Treatise on the Grape” and others do the same in market establishments. The practice of close training is indeed universal among market growers, and none know better than they that neither light crops nor inferior quality of fruit will pay. In discussing the matter sufficient allowance has never been made for the constitutional vigour of varieties. Inexperienced cultivators, who follow the indiscriminate advice sometimes given, would plant all their varieties 3 feet or 4 feet asunder, when it is well known that to give so much room to such kinds as the Grizzly Frontignan, Muscadine, Duchess of Buccleuch, some of the Chasselas and Sweetwaters, &c., would be an extravagant waste of space. If the Syrian or Barbarossa kinds can do with 3 feet or 4 feet of space, there are certainly others that can do with much less. The French cultivators about Fontainebleau and Thomery have doubtless studied this question as accurately as any, having to make the most of the little space at their disposal, and they train their Vines only 16 inches asunder, and take one bunch from every spur-branch, and very often

two—not large ones to be sure; but in the aggregate their crops are excessive. These cultivators show in the most convincing manner that it is not so much the quantity of leaves upon the Vine, on which a good crop of fruit depends, as upon the care taken of the few leaves that are permitted to grow. It is surprising how very few leaves are sufficient to mature a crop of fruit annually, and to sustain the plant in permanent health. From my own practice, and from what I have seen elsewhere, I am perfectly convinced that a Vine shoot pinched one joint beyond the bunch, and kept stopped at that point, is quite capable of maturing the bunch perfectly, provided the foliage is taken care of; it is the old or first leaves on the shoot that do the most of the work, and if they be lost mere extension beyond the bunch will be of little advantage. I dare say many gardeners have discovered this in the course of practice. Looking at the question in its broadest sense, it may safely be decided that $2\frac{1}{2}$ feet of lateral space is quite enough for most varieties of the Vine, and for the strongest growers 3 feet will be sufficient.

Management of Leading Shoots.—Whether the vertical or horizontal system be adopted, the general management in other respects is the same; and, assuming that the rods have been started about $2\frac{1}{2}$ feet asunder, it remains to explain how the Vinery can be soonest furnished

with bearing wood. It does not matter whether each rod be upon its own root or all the rods be originated from one Vine; the treatment of the laterals and leaders is the same. In giving directions on this subject, I may state that I am not going to recommend a more restrictive method of pruning than can be helped, and perhaps my instructions will be found to conflict with others to some extent on the subject of pruning. Most cultivators who have written on the Vine recommend the leading shoots of young Vines to be cut back rather severely—the first year to the bottom wire, or below it, and every season afterwards to within 2 feet, or at the most 3 feet, from the base of the young growth. The reason given for this is that it causes the bottom buds of the cane to break more regularly, and also induces a more vigorous growth in the leader. Neither of these reasons are, however, valid. No doubt the Vine is less disposed to burst its buds regularly than most other kinds of fruit trees, owing to the nature of its growth, and it is equally true that the shorter the young cane is pruned the more readily will the buds left grow. Still it is not necessary to cut almost the whole of a strong young Vine's growth away the first year, or at any time, to secure a good "break." Neither does the mere cutting back of a Vine induce a permanently stronger growth, or add in any way to the vigour of the Vine. How can it? The rebound that a cut-back Vine rod makes

when it begins to grow again is more apparent than real, but it is certain that the Vine which is allowed to make the most growth and pruned the least lays on timber fastest and thickest. For example, a Vine that makes 20 ft. of cane the first year, if left that length at pruning time, will, provided it breaks all its buds regularly, make just as strong a Vine in the end as one which is cut back annually, provided it has been cropped proportionately. In 1867 I planted a house of Muscat Vines from eyes the same year. They all grew strongly, making canes as thick as one's thumb, and all were cut back to about 2 ft. above the bottom wire in winter save one, which was left 19 ft. long, and allowed to carry fourteen good bunches in 1868, all of which finished well. In 1868 the Vine showed no fruit at all, no doubt owing to the ordeal it had been subjected to so early in its career, nor did it cease to exhibit its effects for several years afterwards; but with the exception of the year it missed, it has been cropped fairly every year since. It ought to be the weakest Vine in the house, but good Grape growers have failed to distinguish it from the others after a critical examination, though the latter were cut back every season in the usual way, and cropped moderately at the same time. No difficulty was experienced in getting all the buds on this Vine to break down to the lowermost, and it is one of the most regularly furnished in the house. Again, in 1870, I planted a late Vinery of Lady Downes,

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Alicantes, Barbarossa, and Madresfield Court Grapes from eyes that year; shortened them back to from 8 ft. to 10 ft., including the stem from the border to the wires, at the winter pruning, and took from six to eight bunches from each Vine the second year, the Vines extending their growth in the meantime. By the third year the roof of the Vinery was entirely covered with wood, and the Vines were cropped the full length of the rafters all over the house. These Vines have been cropped every year since that time, and are at the present time in excellent condition, and quite equal to about the same number of Vines of the same kinds in the same house that were pruned short back every season in the ordinary way, till they reached the top of the rafter. To sum up the advantages of the extension system here exemplified, one-half of the Vinery was furnished with bearing wood in two years, and the other half, pruned on the restrictive system, in six years, though 3 ft. of wood was left each season. In the case of the Muscat Vine before mentioned, the rafter was of course furnished in one year. Indeed, so far as my own experience is concerned, I am unable to see any objections whatever to leaving young Vine rods as long as may be desired, provided they are tolerably strong and ripe and the buds can be broken regularly. The first is only a question of culture, but the second, I admit, presents some, but not serious difficulties. The 19ft. long Muscat rod

referred to was only unslung and placed in a horizontal position to induce it to break all its buds, but the late Vines were not meddled with at all. Last winter I left young canes of Alnwick Seedling 12 ft. in length, and, without disturbing them from their upright position, or meddling with them in any way, succeeded in breaking every bud with the exception of three or four. Some of the bottom laterals are stronger than the top ones. I find that by pinching the top shoots first and shortest, and permitting the lower ones to grow, that it is possible to equalise their vigour just the same as in the Peach and other fruit trees. In the same house two Barbarossa Vine rods of one year's growth, and each several feet longer than those of the Alnwick Seedling, broke quite as well, and in two seasons made 60 ft. of wood, all of which was ripened and fruited the year following. As is well known to gardeners, however, Vines break most freely when started about their natural season ; but to test the matter still further, I last winter left the leading canes of a number of half-grown young Vines from 5 ft. to 6 ft. in length, and succeeded in breaking them all early this season in the most regular and satisfactory manner, hardly a bud missing in the lot. The varieties consist of Golden Champion, Venn's Muscat, Pearson's Golden Queen, West's St. Peter, Muscadine, The Duke, and Black Hamburgh, and all have done equally well. To assist the breaking of the lowermost buds 2 ft. of

the points of the canes were depressed at the start, but the lower ties were not unfastened. Had I to prune any number of Vines now after such experience I should not hesitate to leave from 6 ft. to 10 ft. of young wood every year, provided it was moderately strong, nor would I recommend any one to prune more severely. In starting such long rods, however, it is best to afford the Vines plenty of light and to force gently. High temperatures encourage the disposition to run away at the top, and after the top buds have once fairly broken, the chances of the lower ones breaking are reduced.

It should be stated here that, although I was perhaps the first to suggest this quick system of getting up young Vines, I am not the only one who has practised it.* In drawing attention to the subject in the *Garden* last year, another correspondent stated, in answer to my inquiries, that "several houses had been planted on the same plan about Bishop Stortford, and with such good results that more houses had been planted and filled and managed on the same plan."

Mr. Wildsmith, of Heckfield, the well-known Grape-grower, saw the Vines at Wortley alluded to above, and thus speaks of them in the *Garden* of October 9, 1880 :

"The ordinary treatment that young, first-

* Mr. Thomson, of Drumlanrigg, has informed the Author that he "filled a forty feet division with four grafts of the Duke of Buccleuch grape in 1879."

season planted Vines receive at pruning time is to cut them right down, or at least to within 2 feet or so of the bottom, the ostensible reason being that they will break more kindly and evenly than if left longer. That there is a pretty general concurrence in this notion none will question; but Mr. Simpson so disregards all such preconceived ideas that he has dared to leave 30 feet of young wood on a Vine—*i.e.*, a double-caned Vine, 15 feet each. The first thought of every practical man who either hears of or sees this would naturally be that a number of the buds would fail to break; yet such is not the case, for after a close scrutiny I could not discover more than three dormant eyes throughout the entire length; and as to the fruit, the Vine, which was a Barbarossa, was allowed to bear fourteen large bunches, samples of which I have just seen in a ripe state, with large and grandly-coloured berries—indeed, about as fine a sample of Barbarossa as I have ever beheld, and this, be it observed, from a one-year-old cane. In the same house were two young canes of Alnwick Seedling that had been left 12 feet long each, and yet scarcely a bud had missed breaking, and in another house were Hamburgs that had been left at 6 feet, and not a bud had failed to break or to show fruit; moreover, the Vines at starting were not, as is usual, slung in a horizontal position—never, in fact, untied from the trellis except a few inches at the extreme point.”

Management of Lateral Branches.—In a young Vine shoot-buds are produced at the axils of the leaves. These are termed the “permanent buds” to distinguish them from the laterals, that also originate from the same source, and which are permitted to grow a little, but are cut away at the winter pruning entirely, leaving only the permanent buds. The succeeding season the latter produce side or lateral branches, which bear the fruit, and it is with these we have now to deal. Naturally lateral shoots are produced more thickly than is desirable under artificial culture, and they have consequently to be thinned out at an early stage by disbudding. How much apart to leave the shoots depends upon the variety, as in the case of training the rods; 18 inches is about the usual distance recommended, but that is sufficient for the strongest kinds and too much for weak ones, which do not require more than 1 foot of space for each shoot, but out of doors 9 inches will be enough, as the general growth is less luxuriant under such circumstances. The best and most fruitful shoots should be left, as far as practicable, and they should be tied in to the wires in an oblique upward direction. When they have made from six to eight leaves, or let us say joints, they should have their tops pinched, and from this time forward to the end of the season all sub-laterals must be stopped at one or two joints until the space at the disposal of each shoot is filled up. If thinning be

necessary after that period, it must be effected by judiciously shortening the sub-laterals to "back joints." Other culture consists in preserving the shoots and leaves in good health by keeping down insects and administering a proper temperature, etc. When the leaves have fallen off the Vines in winter the first side pruning will become necessary, and it does not differ in principle from that of succeeding years when the Vines are older. There are two systems of spur pruning—the close and the long spur. In the first the shoot is usually cut close back to the last bud, and in the second two or three or more buds are left. The greater number of varieties submit to close pruning, which is also productive of the most compact, well-finished bunches, but there are some varieties that are apt to miss fruiting partially if they are pruned too hard back, and among these may be named Golden Champion, Black Alicante, Syrian, Barbarossa, and some others of the strong-growing late varieties. Vines vary in this respect, however, in different situations, and it will be found the best plan with shy fruiterers generally to leave several eyes at pruning time. In pruning a sharp knife or *secateur* should be used, and the shoot should be cut back to within an eighth of an inch of the bud left. When the Vines are started the second year all the buds should be thinned out to one of the best on each spur, to be trained and pinched as in the previous season. There has at

times been much discussion among Grape-growers concerning the necessity of leaving one or more joints beyond the bunch in pinching the fruiting shoots, growth beyond that point being considered necessary for some as yet undefined physiological reason. As others besides the writer have proved, however, and stated in the horticultural papers, it is of little or no consequence whether the growth extend beyond the bunch or not, provided there is a good foliage upon the shoot and near to the fruit. It is generally more convenient, however, to pinch several joints beyond the bunch, as, for example, when the latter is produced near the base of the shoot, and too little wood would be left by close pinching; but when the bunch is produced perhaps 1 foot or 15 inches from the main stem, it may be stopped just beyond the bunch in order to keep the subsequent growths within bounds. In the outdoor culture of the Vine lateral restriction is absolutely necessary, in order to promote the ripen-



DIAGRAM.

FIG. 4.—The Vine. Spur Training: *a, a*, lateral or fruiting branches; *B, B*, lines showing where the branches are shortened back to one bud at the winter pruning.

ing of the wood, upon which so much depends. The earliest pinched shoot is the one that gets brown and ripe first, and hence early pinching means early maturity and greater fertility.

Supernumerary Vines.—As these are only intended to remain to fruit till the permanent Vines come fairly into a bearing state, they must be treated with an eye to fruiting the year after planting, and for a few years following. The front row of plants which, it will be recollected, are planted between the permanent Vines, should be allowed to grow about 7 or 8 feet up the wires, and then stopped; the laterals also must be pinched regularly at every joint; the middle row will catch the wires at this point, and they must also be stopped when they have got nearly to the top of the rafters, and otherwise treated in the same manner. The little winter pruning required by these consists in simply cutting the laterals close back to the permanent buds—which should, at the end of the season, be hard and plump—and in shortening back each cane to within 6 feet or so of the point where they first catch the wires.

CHAPTER VIII.

CROPPING THE VINE.

THE training of the shoots having been explained in the foregoing chapters, we have but to notice the cropping of the Vines here. The weight of crop a Vine may bear regularly every year is the true test of culture. Much, however, depends on circumstances and the growth of the Vines. One pound weight of grapes to the foot run of Vine rod is considered a fair crop if continued year after year; but the Vine will only do this when maintained in vigorous health, and good health is indicated by good foliage, large and of good texture, and borne upon stout short-jointed wood, well ripened. A good Vine rod is one which, if young, is as thick as one's finger or thumb; which produces large leaves, and, in an adult Vine, laterals at least as thick as a stout quill. When Vines produce small pale leaves and weak shoots spindling out at the points; and when they produce small bunches inclining to tendrils they are weak and unfit to be cropped even moderately. Bad colour and shanking are

also unfailing signs of over-cropping, and when these are apparent it behoves the cultivator to crop very lightly the following season and for some time to come; unless these evils are traceable to other causes. The Vine usually produces many more bunches than it can mature well, hence they must be reduced in number as soon as it is seen which are best, and these can be seen before the bunches come into flower. Not more than one good bunch should be left on a shoot, and at the rate of cropping already recommended per foot it will be discovered in practice that a bunch cannot be left on every shoot, but only on about every alternate one.

Thinning the Berries.—All the bunches will not set simultaneously; but thinning must commence with the earliest set bunches before the berries are much larger than pin-heads (except in the case of Muscats and shy-setting varieties, which must be left until it is seen which berries are taking the lead), when the bunches can be thinned finally at once, which is preferable to going over them a second time. To keep the bloom in perfection and the bunch compact the less the berries are handled the better. With a light wooden peg in the left hand, and a pair of clean Grape scissors in the right, the operator should begin at the bottom and work to the top, easing the shoulders with the peg, and thinning out all the small and innermost berries, being

careful not to rub them with either the peg or scissors. More than half of the berries, as a rule, require cutting out, leaving plenty of room for those left to swell; but discretion must be used in accordance with the variety. Sufficient, however, must be left to make a compact bunch when finished, as nothing looks worse than a bunch of Grapes, when laid on a dessert dish, spreading all over it. It should lie as compact in shape as when growing on the Vine.

Ripening the Crop.—The ripening process begins after the stoning process is completed, the berries then beginning to change from the sour to the saccharine state, and at the same time finishing their swelling, which comes to a standstill during the stoning period. The treatment required by the Vines during their latter stage hardly differs from that given during the preceding period, except that the temperature day and night should be kept at the maximum given under the head of "Temperatures," and that as the fruit ripens a drier air and freer ventilation should be afforded until the Grapes are quite ripe, when the Vinery should be kept cool and dry, but the temperature should not fall below 40° or 45°; at a lower temperature a stagnant atmosphere is likely to promote damp and rotting.

CHAPTER IX.

POT VINES.

Pot Vines are generally grown for early crops. The plants are struck from eyes, as directed under the head of "Propagation," potted in 10 or 12 inch pots, in good soil; grown on during the summer in the same way as other young Vines, and as has been advised; pruned as soon as their wood is ripe and hard, leaving as many feet of cane as is thoroughly matured, and they are forced at any season from November onwards—the treatment in all other respects being the same as for permanent Vines. Pot-Vine culture is not an advisable practice except as a make-shift, or for very early crops, and very often fails in the hands of amateurs and others, who are often persuaded to adopt the plan.

CHAPTER X.

CULTURE OF THE VINE ON WALLS IN THE OPEN AIR.

Borders.—These should be made as recommended in the case of Vinery borders, but it is not advisable to have them more than 18 inches deep, and they should be well drained and bottomed, to prevent the roots penetrating the sub-soil. A light warm soil should be used, and the border should slope well to the sun.

The Vines, one-year old plants cut down, should be planted about 18 inches asunder in spring, and be trained upright on the spur principle, as shown in Fig. 4, but the side branches need not be above 9 inches apart, as they do not grow so rank in the open air. They should be trained in a sloping direction upwards, till the shoots of the Vines meet, which will allow them from 9 to 12 inches of growth, and at that length they should be stopped, and kept stopped by pinching at every joint as fast as the shoots grow. The great point in out-door culture is to ripen the wood perfectly, and this can only be secured by attention to training and pinching to prevent crowd-

ing. In autumn the side shoots should be cut back to one or two eyes. These eyes will push one or more shoots in the next season, but all should be rubbed off except one—the strongest and most fruitful—which should be trained as in the preceding year, to be pruned back again in the same way at the end of the year, and so on annually. If the Vines have good foliage and are in good health a moderate bunch may be left to each shoot, and the Berries must be thinned out—as described in a previous chapter—and before they get too large. The fruit usually ripens in October, and if protected and kept dry by shadings may be kept hanging on the Vines for a good while after it is ripe.

Keeping Grapes after they are ripe.—Grapes grown in English Vineries have often been kept in perfect condition for nearly nine months after they were ripe. It is seldom necessary or advisable, however, to keep any but winter or late supplies very long, as from April till November the supply can be brought on in successional crops as required. Grapes keep best and longest, and retain their flavour better when kept hanging on the Vine, and in the case of late crops, unless the Vinery be wanted in the interval for other purposes, they should be allowed to hang till it becomes necessary to prune the Vines. We have done this for eighteen years with the same Vines without the least injury to their health. When

the Grapes have to be cut from the Vines the bunches should be removed with the shoots attached to them and the shoots inserted in bottles of water and charcoal suspended from a rail in a dry and cool room away from frost, draughts, or damp. The temperature should not exceed 45° or 50° if it can be helped: dryness and an equal temperature is everthing in keeping. The bunches should be frequently looked over and have the bad berries cut out of them, as a rotten berry will soon cause the destruction of the whole bunch. When the Grapes are kept upon the Vine the same conditions must be observed. There are few places so good for keeping Grapes as a spare dry room in a dwelling-house where there is no fire.

CHAPTER XI.

DISEASES AND INSECTS WHICH ATTACK THE VINE.

Vine Louse (*Phylloxera Vastatrix*).—This is the worst plague the Vine is subject to, as when it does attack the plant there appears to be no remedy save stamping it out by destroying the Vines, thoroughly cleaning out both borders and Vineries and planting afresh. The Vine Louse has not been very destructive in English Vineries yet, and as it attacks the Vine only, it may be kept out of a garden by care and watchfulness. In gardens where it has appeared it has generally been transmitted with the soil or plants, &c., from other places. Affected Vines grow sickly and die, a thing which rarely happens from any other disease or insect attacks; hence when such a thing occurs the Vine grower has reason to suspect the presence of the enemy, and should lose no time in having both the roots and tops of the Vines examined by an expert.

The *phylloxera* somewhat resembles the aphid and appears in two forms, according to those who have investigated the matter, one of which

attacks the roots and the other the leaves, where it forms warty-like excrescences, on their undersides, in which the young are hatched. When any signs of debility appear on vines, these appearances should be watched for, and both roots and leaves examined by a microscope, which will reveal the insect if it be present, in which case instant measures should be taken to prevent it extending.

We have known of bad cases of *phylloxera*, in which it had been got rid of by the complete renewal of the borders and planting fresh vines; and other cases where the pest was said to have been got under without resorting to such extreme measures; but our opinion in every case, judging from the condition of the vines, and the quality of the crops afterwards, was that the stamping-out plan was by far the best. Vines attacked by *phylloxera* are not renovated in a year or two (even when the insect has been banished, if one can ever be sure on that head without renewal of the borders and the vines), whereas young vines, including supernumeraries, can be had in crop the year after planting. The ravages of the *phylloxera* are so serious, and the risk of its spreading so great, when once it gets a footing, that we advise the stamping of it out in all cases, more especially as no sure means are known of destroying it otherwise.

Mealy Bug.—This almost ineradicable pest

infests the leaves and bunches of the Vines during the season of growth, rendering the first almost unfit for use; and harbours under the loose bark of the Vine, in the border about the roots, and in walls and crevices in winter. The only way to get rid of it is to clean all the loose bark off the Vines in winter, seal up with painter's "patent knotting" all holes in the Vines, such as occur at old wounds where the pith has sunk in, wash the rods, and afterwards paint them with a thick smearing, composed of clay, tobacco liquor, soft soap, and a little paraffin oil. This will destroy a good many insects, but in addition the border should be cleaned on the surface, and the wood-work and walls all scrubbed and painted effectually, sealing up every hole and corner where a bug can shelter. If these measures are carried out every winter, while any bug remains, and the leaves are attentively watched and cleaned with soap and water during the summer, bugs may be extirpated in two or three years. Everything depends on preventing it extending when the Vines are in leaf, as it is then most active, and one season's neglect will render it as bad as ever.

Mildew.—Fortunately this disease does not very often attack Vines grown under glass in this country, and good culture and attention will generally ward it off; but when it does get established upon the plants, it is most destructive in

its effects. It is generally the result of unhealthy root action, a too low temperature when the Vines are in full growth (thereby predisposing them to the disease), a stagnant atmosphere, insufficient ventilation, or, in fact, anything which lowers the vitality of the Vine when it is growing. Intelligent treatment, therefore, such as we have recommended in former chapters, is the best preventive. The disease should always be watched for, however, as preventive measures, when it does occur, are only successful when taken early. It always appears at first upon the surface of the leaves, in the form of small white dusty-looking specks, just indicating that the parasite has taken hold; but it will often appear over a whole house of Vines before its presence is noticed or even suspected, and, if not checked, it spreads over the leaves with marvellous rapidity, killing the tissue wherever it establishes itself; eventually it reaches the berries, covering them as with a white hoar, destroying their skin as it does the tissue of the leaves, and utterly spoiling the crop and seriously injuring the health of the Vines. It can only be checked, when it does appear, by timely action, and sulphur is the only remedy. The sulphur should first be mixed with a small quantity of milk until it is thoroughly disintegrated, then poured into a pitcher of water, and applied to the Vine with a syringe until every leaf is wetted. This will seldom fail to destroy the parasite, though it may

have to be applied more than once. In winter the Vines should be washed, and afterwards painted with sulphur and milk.

Shanking.—This is a disease incidental to bad culture and certain soils, and is, more or less, well known to all Grape-growers. The disease attacks the foot-stalk of the berries at or after the stoning period, when the berries are changing colour. They lose their fleshiness, have a disagreeably acid taste, and soon shrivel and drop off if the bunch is shaken. In aggravated cases the whole crop is sometimes lost for several years in succession. Various causes have been assigned for the disease: such as great disparity between the temperature of the border and that of the vinery, heavy cropping, excessively high temperatures, &c. No doubt debility, arising from any cause, will help to bring on the disease; but it is a fact that it will attack in its worst form Vines that possess the greatest apparent health and vigour as regards wood and foliage, and where the highest skill is brought to bear on their culture. One of the worst cases of shanking that ever came under my notice occurred in Vineries where the borders were all inside, and were heated with hot-water pipes. The borders were made of the most approved materials, and nothing was wanting, it was thought, to ensure success. The Vines grew vigorously, and were not cropped till the third year, and then only

moderately ; the bunches were large and promising, but nearly every berry shanked up to the foot-stalk of the bunches ; and this went on more or less for years, till the Vines were pulled up. I ought to state, however, that shanking had always been unusually troublesome in the place, attacking both young and old Vines, pot Vines, and Vines growing in outside and inside borders ; and it went on under the superintendence of different gardeners, who, before and afterwards, produced excellent Grapes in other parts of the country. We are forced to the conclusion, therefore, that the disease must have been due to something in the soil, or to its deficiency in some quality or other which was needful to the well-being of the Grape. The staple of all the borders was turf from pastures, of a light texture, and from a gravelly sub-soil, and lime scraps were added to it. It would seem, therefore, that shanking may arise from circumstances over which one may have no control, so far as our present knowledge of the disease extends ; but I have invariably observed that it was least troublesome in heavy soils. In our very heavy soil here shanking is quite unknown ; nor, though good and indifferent Grape-growing may be seen in the district upon the same formation, I have never seen any serious cases of shanking. Under these circumstances I feel I cannot offer any specific advice on the matter, further than is contained in my former remarks on the subject

of soil, border-making, watering, airing, temperature, cropping, &c., which, if carried out, will go far towards preventing the disease.

Red Spider and Thrips.—The first-named of these two plagues is most to be feared, though thrips, individually, are by far the most destructive; but, as they do not breed so fast, they do less damage. Red spider is always most destructive in Vineries where much artificial heat is used, and, for that reason, experienced Grape-growers dispense with fire heat whenever opportunity offers, especially at night. I can give no better advice than this, unless it is to say, “give your Vines abundance of water at the root, and contrive, by moderate temperature and otherwise, to secure a stout and healthy condition of the foliage, for red spider always finds out the weakest subjects and the weakest varieties.” Syringing as often as possible will help to keep the Vines free, and it is well worth while to wash the leaves with a sponge and soft water whenever they are observed to be affected. The same preventive measures should be taken with thrips, and they may also be smoked successfully with tobacco paper; but not after the Grapes are ripe, as the tobacco strongly affects the taste of the Grapes.

Rust.—Rusty Grapes are the result of contact with some other object, such as the hands or the head, or sudden draughts of cold air against the

berries when they are just set, and, above all, of very hot pipes at that time. I am perfectly convinced that excessively hot pipes will produce rust on any variety of Grapes sooner than anything else. Of many well-proved cases of this I will give one which happened here. Some years ago the man in charge of the Vineries inadvertently let the pipes get too hot in a Muscat and Hamburgh house, when the berries had just set; the pipes were so hot as to smell strongly, and blister the hand when held upon them. They were not so long, however, for, anticipating the consequences, I had the pipes emptied as soon as discovered, but not soon enough to save the Grapes. The rust was visible a day or two after, being worst round the ends of the houses, and along the front—in fact, everywhere near the pipes, and gradually getting less and less further up the roof. The Hamburghs were the worst affected, but some of the Muscats were bad enough. Lady Downes and Black Alicante seem less susceptible than most other varieties; but they, too, take it occasionally. I have frequently had a few bunches rusted in one particular corner of our late Vinery, where they hung rather near the pipes. My advice, therefore, is, “avoid all these causes, and rather do with low temperatures in cold weather than too hot pipes.”

Warty Leaves.—It has often been asserted, in horticultural journals, that the warty excres-

cences which appear on the under side of the Vine-leaf, under certain circumstances, do no harm to the Vine; but this is a great mistake. The warts are the constant result of a close damp atmosphere and insufficient ventilation; they never appear under any other conditions. The warts first appear thinly scattered over the leaf; they get thicker and thicker until they coalesce; the leaves become cupped and crumpled; the growth of the plant is completely arrested, and no curative measures will restore it to health again after it gets to this stage, though sulphur on the pipes will kill the warts. The only preventives are a dry atmosphere and plenty of air. It is a disease that should never occur to any serious extent under ordinarily good culture.

Scorching of the Berries.—This scorching, which takes place when the berries are about half-swelled, is almost confined to the Lady Downes Grape, and is sometimes very destructive, but scarcely ever so under good management. The damaged berries appear black and discoloured on one side, the tissues being simply killed, as if the berries had been dipped in boiling water. When it appears, the temperature should be lowered a little, and more air and a drier atmosphere given. This generally prevents further destruction. Vines that are not forced too hard, but brought on gradually with a free and constant circulation of air in the house, are seldom affected.

CHAPTER XII.

LIST OF BEST ENGLISH GRAPES.

EARLY GRAPES.

<i>Black.</i>	<i>White.</i>
† † Black Hamburgh	† Royal Muscadine
Black Prince	White Frontignan
† Black Frontignan	† Buckland's Sweetwater
† Madresfield Court	† Foster's White Seedling
Black Cluster	Chasselas Musque

MID-SEASON GRAPES.

<i>Black.</i>	<i>White.</i>
† Black Hamburgh	† Buckland's Sweetwater
† Madresfield Court	Foster's Seedling
Alnwick Seedling	Golden Champion
	† Muscat of Alexandria

LATE GRAPES.

<i>Black.</i>	<i>White.</i>
† Black Alicante	† † Muscat of Alexandria
† Lady Downes	† Golden Queen
† Gros Guillaume	Syrian
Gros Colmar	White Nice
Mrs. Pince	† Calabrian Raisin

Those marked † are the best in each class. The Black Hamburgh and Muscat of Alexandria are the two best grapes for general culture.

CHAPTER XIII.

AMERICAN GRAPES.

HITHERTO, these have not been much grown in England, and an impression exists that they are inferior to the European varieties of which, perhaps, the very best are cultivated in English gardens.

Americans, however, who grow both the European and American varieties, have expressed the confident opinion that some of the latter would succeed better out of doors in England than our own kinds, and prove acceptable for dessert purposes also; the musky flavour of the fruit being not only soon got over, but, it is asserted, liked. Several of the American grapes are handsome and prolific, and in flavour better, we are assured, than the *Gros Colmar*, now so much grown for the London and other markets. One valuable characteristic of the American varieties is their vigorous and hardy constitution, which enables them to withstand diseases and insect pests better than the European kinds, and, probably, the two species might be crossed

with advantage in that respect. Mr. H. B. Ellwanger, of Mount Hope Nurseries, Rochester, N. Y., thus speaks of American grapes, in the *Garden*, and gives the following list of good sorts :—

Why is it that English people who are fond of good things when once they have found them out, have not made trial of our native Grapes for outdoor culture? I am sure that in the southern portions of England, such as Cornwall, our early varieties of Grapes would do fairly well, even if not perfectly successful, and it might prove that they could be satisfactorily grown quite far north; at any rate it would be well worth giving them careful trial. It is generally conceded that Peaches and Grapes are our most delicious fruits, and if it were found by trial that either of them could be produced by ordinary open-air culture, what a boon it would be. Whatever may be the opinion as to the practicability of growing Peaches in the open air in the south of England, I feel confident that many varieties of American Grapes could thus be grown, since they are hardier and far more reliable in fruiting than are Peaches. These Grapes will not, perhaps, attain the high flavour that they have in this country, and will not be found quite equal to the varieties of European Grapes grown under glass, though a large number of connoisseurs give them the preference. Many of the varieties now grown proceed directly or indirectly from varieties indigenous to this country; others have been crossed

with European sorts. I should recommend a careful trial of the following sorts:—

Black.—Adirondack, bunches large, berries rather small; of excellent quality, ripe the 1st of September. Concord, a large handsome sort, very hardy and productive, though inferior in quality to the others named; it is the most reliable. Creveling, bunch loose, but a fine sort. Eumelan, very crisp and excellent, but does not set as well as the others. Worden resembles the Concord, but is sweeter.

Red.—Brighton, very rich and high flavoured. Delaware, bunches and berries both small. Lindley, long bunches, very sugary. Massasoit, something like Lindley.

White.—Rebecca, small bunches, skin rather tough, but with tender, sprightly flesh. Duchess, bunches long and compact, flesh tender. Lady Washington, bunches very large and compact, often double-shouldered. When fully ripe the berries turn yellow in colour, often taking a tinge of delicate pink when exposed to the sun. One of the most beautiful Grapes known. The two varieties last named are new, and have not generally been proved, but as both promise to be valuable additions I think them worthy of commendation for trial.

The list given includes varieties which differ greatly in their characteristics, and some of them

would doubtless succeed better in certain localities than others. I hope there may be found many to make trial of them."

In addition to the above may be named the Prentiss Grape, a white variety, described as one of the best; and the Catawba, black, which has been long cultivated in America.

THE END

• NOVELS AT ONE SHILLING.

W. H. AINSWORTH.

Windsor Castle.
The Tower of London.
The Miser's Daughter.
Rookwood.
Old St. Paul's.
Crichton.
Guy Fawkes.
The Spendthrift.
James the Second.
The Star Chamber.
The Flitch of Bacon.
Lancashire Witches.
Mervyn Clitheroe.
Ovingdean Grange.
St. James's.
Auriol.
Jack Sheppard.

WM. CARLETON.

Jane Sinclair.
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The Waterwitch.
Two Admirals.
Satanstoe.
Afloat and Ashore.
Wyandotte.
Eve Effingham.
Miles Wallingford.
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